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CONDITION SURVEY, WHITEMAN AIR FORCE BASE, MISSOURI.(U)
JUN 73 P J VEDROS, S J ALFORD, J C HART

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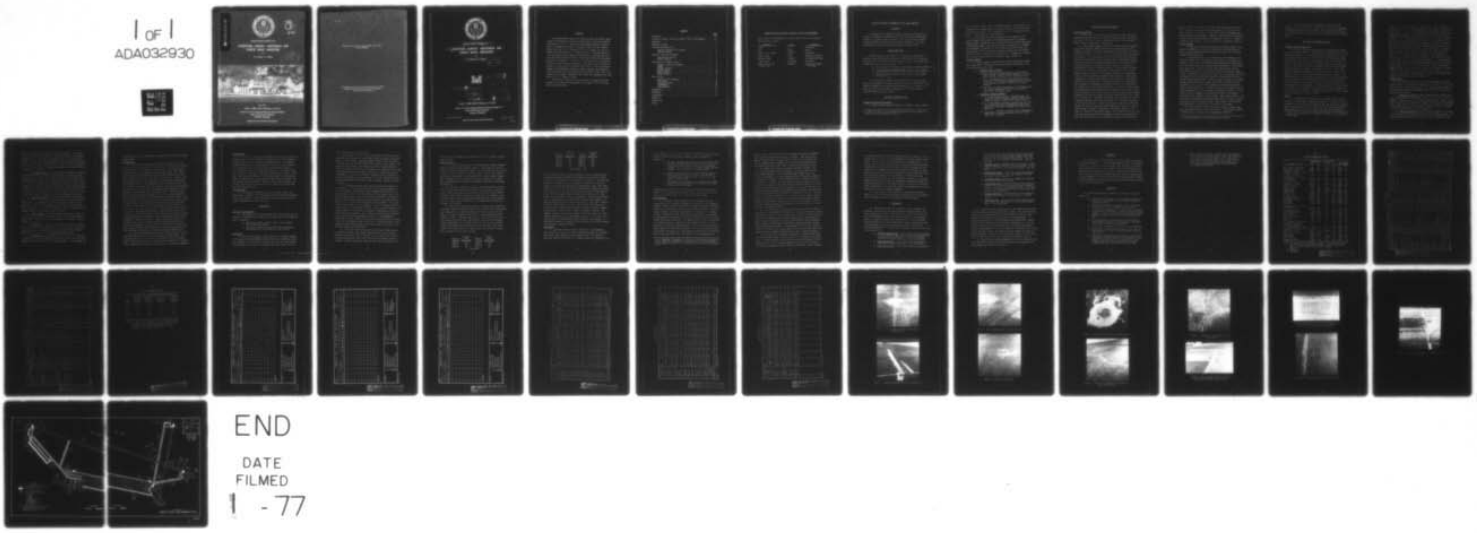

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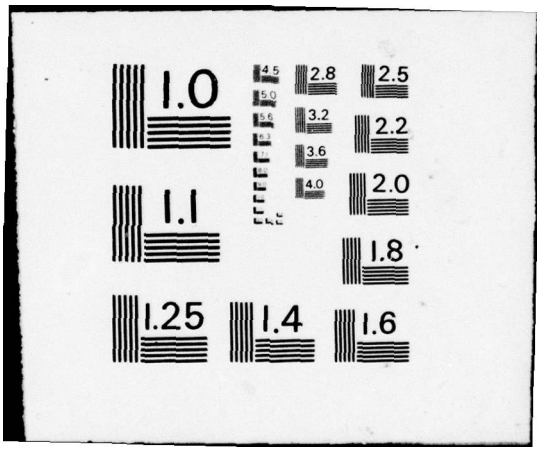
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MISCELLANEOUS PAPER S-73-45

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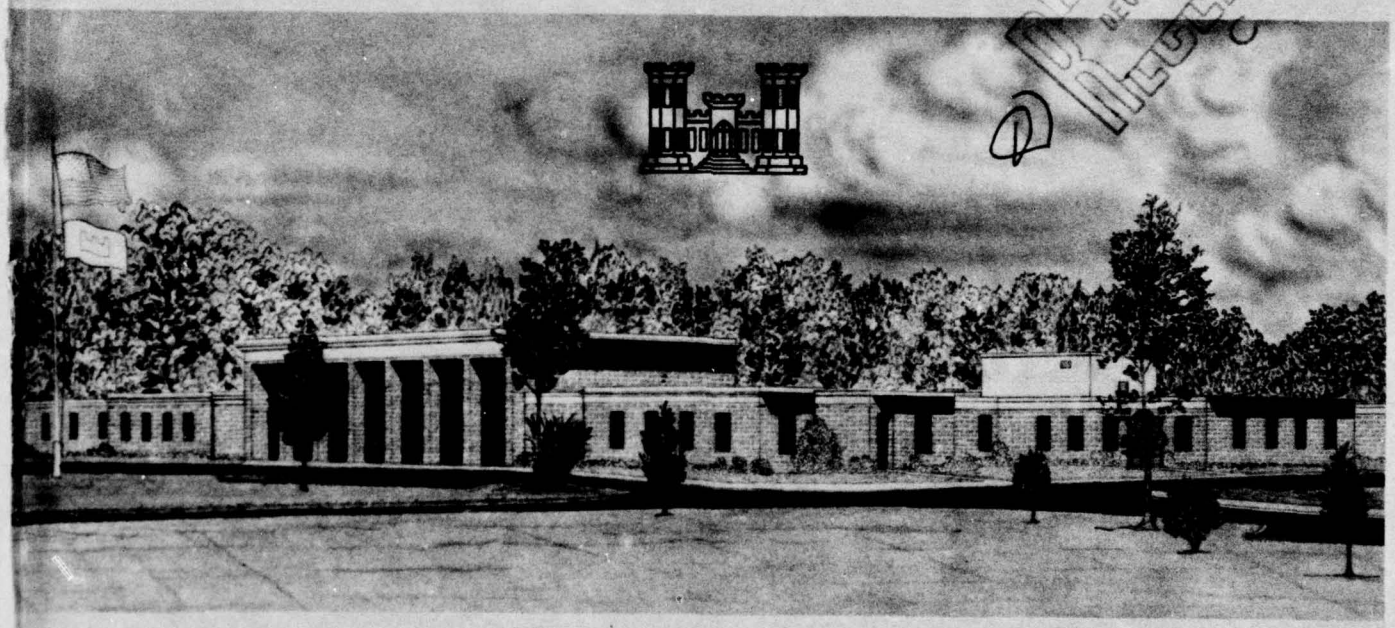

June 1973

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Conducted by U. S. Army Engineer Waterways Experiment Station
Soils and Pavements Laboratory
Vicksburg, Mississippi

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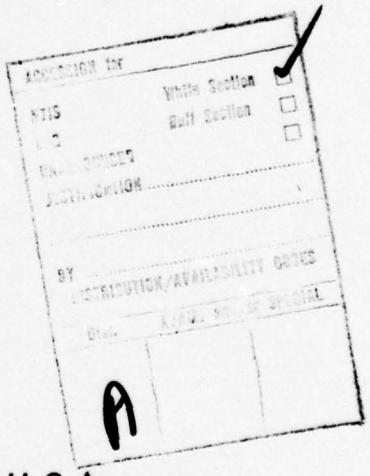
(9) MISCELLANEOUS PAPER S-73-45

(6) CONDITION SURVEY, WHITEMAN AIR FORCE BASE, MISSOURI.

by

(10) P. J. Vedros, S. J. Alford, J. C. Hart
G. D. Gilman



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Foreword

The study reported herein was conducted under the general supervision of the Engineering Design Criteria Branch, Soils and Pavements Laboratory, of the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi. Personnel involved in the condition survey were Messrs. H. T. Thornton, Jr., R. N. Gordon, Sr., and S. J. Alford of the WES and Mr. J. C. Hart of the U. S. Army Engineer Division, New England (NED), Waltham, Massachusetts. The main portion of this report was prepared by Messrs. Vedros and Alford under the general supervision of Messrs. J. P. Sale, R. G. Ahlvin, and R. L. Hutchinson of the Soils and Pavements Laboratory. That portion of the study pertaining to frost action was carried out by the U. S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, New Hampshire, with the assistance of the Foundations and Materials Branch, NED. The section of this report concerning frost action was prepared by Mr. Hart and by Mr. G. D. Gilman of CRREL.

COL Ernest D. Peixotto, CE, was Director of the WES during the conduct of the study and preparation of the report. Mr. F. R. Brown was Technical Director.

Contents

Conversion Factors, British to Metric Units of Measurement

British units of measurement used in this report can be converted to metric units as follows:

Multiply	By	To Obtain
inches	2.54	centimeters
feet	0.3048	meters
miles (U. S. statute)	1.609344	kilometers
square inches	6.4516	square centimeters
miles per hour	1.609344	kilometers per hour
pounds (mass)	0.45359237	kilograms
pounds (force) per square inch	0.6894757	newtons per square centimeter

CONDITION SURVEY, WHITEMAN AIR FORCE BASE, MISSOURI

Authority

1. Authority for conducting condition surveys at selected airfields is contained in amendment to FY 1972 RDTE Funding Authorization (MFS-MC-5, 16 February 1972), subject: "Air Force Airfield Pavement Research Program," from the Office, Chief of Engineers, U. S. Army, Directorate of Military Construction, dated 18 February 1972.

Purpose and Scope

2. The purpose of this report is to present the results of a condition survey performed at Whiteman Air Force Base (WAFB), Missouri, during 9-13 May 1972. The following three major areas of interest were considered in this condition survey:

a. The structural condition of the primary airfield pavements,

b. The condition of pavement repairs and the types of maintenance materials that have been used at this airfield; and

c. Any detrimental effects of frost action to the pavement facilities.

3. This report is limited to a presentation of visual observations of the pavement conditions, discussion of these observations, and pertinent remarks with regard to the performance of the pavements. No physical tests of the pavements, foundations, or patching materials were performed during this survey.

Pertinent Background Data

General description of airfield

4. WAFB, formerly Sedalia Airfield, is located 2 miles* south of

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* A table of factors for converting British units of measurement to metric units is presented on page vii.

Knob Noster and 21 miles west of Sedalia, Missouri. The airfield is on a generally flat plateau amid the rolling landscape of central Missouri. The general elevation of the airfield is 840 to 870 ft above mean sea level. A vicinity map is shown in plate 1.

5. In May 1972, the airfield facilities consisted of a N-S (18-36) runway, four taxiways connecting the runway to the aprons, a parking apron, a refueling apron, an alert apron, two hangar aprons and a connecting taxiway, three warm-up aprons, a washrack, and a calibration hardstand. The runway was 200 ft wide and 12,400 ft long; the parking apron was 975 ft wide and of varying length; and the taxiways were 75 ft wide. A layout of the airfield and a pavement plan indicating the type pavement on each facility are shown in plate 1.

Previous reports

6. Previous reports concerning the airfield facilities at WAFB are listed below. Pertinent data were extracted from them for use in this condition survey report.

a. Condition survey reports:

(1) Ohio River Division Laboratories, CE, "Report of Rigid Pavement Condition Survey, Whiteman Air Force Base, Missouri," February 1957, Cincinnati, Ohio.

(2) U. S. Army Engineer Division, Missouri River, CE, "Report of Rigid Pavement Condition Survey, Whiteman Air Force Base, Missouri," January 1959, Omaha, Nebraska.

(3) Ohio River Division Laboratories, CE, "Condition Survey Report, Whiteman Air Force Base, Missouri," April 1961, Cincinnati, Ohio.

b. Pavement evaluation reports:

(1) U. S. Army Engineer Division, Missouri River, CE, "Pavement Evaluation Report, Sedalia Airfield, Knob Noster, Missouri," October 1944, Omaha, Nebraska.

(2) U. S. Army Engineer District, Kansas City, CE, "Airfield Evaluation Report, Whiteman Air Force Base, Knob Noster, Missouri," December 1958, Kansas City, Missouri.

(3) _____, "Airfield Evaluation Report, Whiteman Air Force Base, Knob Noster, Missouri," October 1960, Kansas City, Missouri.

History of Airfield Pavements

Construction history

7. WAFB, which was Sedalia Airfield prior to 1954, was first developed during World War II as a glider training field. The airfield was inactive for about 6 years following World War II but was reactivated in 1954 as a medium jet bomber field.

8. The original pavements at this airfield were all constructed of 9-7-9-in. portland cement concrete (PCC) placed directly on the subgrade. Original construction was completed in 1942 and consisted of four runways (NE-SW, NW-SE, E-W, and N-S), a parking apron, and connecting taxiways. Upon reactivation, some of the original airfield pavements were strengthened, and new pavements were constructed according to the then existing heavy-load design criteria. The original NE-SW and NW-SE runways were abandoned, and the original N-S runway was strengthened to serve as a refueling apron. (The original E-W runway now serves as a crosswind runway for light aircraft.) The original parking apron and several of the original taxiways were strengthened. A new N-S runway, additional taxiways, warm-up aprons, a hangar apron, a washrack, a calibration hardstand, and an extension to the parking apron were also constructed. During the later phases of construction, the N-S runway was extended to its present length. All construction was accomplished during the period 1953-1956. In 1959, the alert apron and taxiway were constructed and used for parking alert aircraft. Pavements constructed at this time were PCC, except the blast pads, shoulder pavements, and transition areas, which were surfaced with a 2-in. thickness of hot-mix AC. Pavements were designed in accordance with criteria in Engineer Manuals 1110-45-302, -303, and -306, which were in effect at the time of the design. Except for the alert apron and taxiway and taxiways 17 and 18, the design of the pavements was based on a landing gear loading of 100,000 lb supported on twin wheels spaced 37.5 in. center to center with each wheel having a tire contact area of 267 sq in. The alert apron and taxiway and taxiways 17 and 18 were designed for a gear load of 265,000 lb on twin-twin wheels abreast, with each wheel

having a tire contact area of 267 sq in. The twin wheels were spaced 37 in. center to center, with the inside wheels of each set of twin wheels spaced 62 in. center to center, and a bicycle arrangement was used for the main landing gears. Details of the design and construction history of the airfield pavements are presented in table 1. Pavement thicknesses, descriptions, and other details are presented in table 2.

Traffic history

9. Detailed traffic records were not available; however, some traffic information was available from previous condition survey reports and from information obtained during the survey for the period January 1968-December 1971.

10. During World War II, the airfield was used mainly by C-47 aircraft, gliders, and miscellaneous light aircraft. Following reactivation of the base in 1954 and the subsequent pavement construction, B-47's and KC-97's were the primary aircraft operating at the airfield until August 1963. From 1954-October 1955, approximately 400 and 300 cycles* per month of B-47 and KC-97 traffic were applied, respectively. During the period April 1957-June 1960, approximately 240 cycles per month of B-47 aircraft traffic and 100 cycles per month of KC-97 aircraft traffic were applied. Traffic records obtained for the period January 1968-December 1971 indicate that traffic consisted of four categories (A, B, C, and D), with category D involving the heaviest aircraft (over 150,000 lb). A detailed listing of the traffic for the 4-year period for the four categories is presented in table 3. Of the cycles listed in category D, 60 percent were from C-141 aircraft; 35 percent, KC-135 aircraft; and 5 percent, Logair cargo aircraft. The N-S runway is the primary instrument runway, and it is used by practically all aircraft operating at WAFB. Sixty percent of the takeoffs and landings are from the north (18) end of the N-S runway.

11. The east warm-up apron is used as a missile loading ramp. This ramp receives about 4 cycles per month of C-141 aircraft traffic. A missile and its container weigh approximately 80,000 lb.

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* A cycle of operation is one takeoff and one landing.

12. It was reported that the taxiways at this field (the shoulders of which are only 25 ft wide) are too narrow to accommodate the outrigger wheels of B-52 aircraft. During the few operations by B-52 aircraft at the base, taxiway lights were damaged by the outrigger wheels.

Conditions of Pavement Surfaces

Pavement inspection procedure

13. The following procedure was used in conducting the inspection of the rigid pavements. Representative features were selected for detailed inspection. The features were then inspected slab* by slab, and the defects were recorded. The locations of the individual pavement features, the inspection starting points, and the directions in which the pavements were inspected (shown by arrows) are indicated in plate 1. The results of the rigid pavement survey for those features that were inspected in detail are presented in table 4. This table shows a quantitative breakdown of the various types of defects and a condition rating for each pavement feature inspected in detail. The procedures used for determining the condition rating of a pavement are given in Appendix III of Department of the Army Technical Manual TM 5-827-3, "Rigid Airfield Pavement Evaluation," dated September 1965. The pavement defect identified as a keyed joint failure in table 4 was not included in the reference manual, because this type of defect has only recently been observed. It results from traffic of heavy aircraft and is considered to be a major defect.

Runway

14. In general, the condition of the pavement surface on the N-S (18-36) runway ranged from good to excellent. The first 500 ft of the north end of the runway (feature R1A) had only two slabs containing major defects, and about 15 percent of the slabs contained pop-outs. The second 500 ft at this end (feature R2B) was also in excellent

* A slab is the smallest unit, containing no joints, of a given pavement feature.

condition, with no major defects recorded. Both of these features were 18-in.-thick PCC. In the interior portion of the runway (feature R3C), which consists of 16-in.-thick pavement, only one percent of the slabs contained major defects. The 18-in.-thick pavement in the adjacent interior portion of the runway (feature R4C) was in excellent condition, with no major defects recorded. In the 15-in.-thick pavement in the next interior portion of the runway (feature R5C), about 18 percent of the slabs contained a major defect. Approximately 40 slabs were observed to have a keyed joint failure. About 80 percent of the major defects recorded in this feature occurred in the center 50-ft-wide portion. As is noted in table 4, there were also approximately 350 slabs in which "D" cracking was observed. This defect will lead to scaling and spalling as the cracking progresses. In the south end of the runway, which is 19-in.-thick pavement (feature R7A) and 17-in.-thick pavement (feature R6B), one slab in each feature contained a diagonal break; however, every slab in the 17-in. pavement and 57 percent of the slabs in the 19-in. pavement had "D" cracking. As is indicated in paragraph 10, approximately 40 percent of the takeoffs and landings occur at this end of the runway.

Primary taxiways

15. The primary taxiways used for normal operations from the parking aprons to the runway are taxiways 16B, 16A, 12A, 12, 1, 2, 11A, 11B, 17, and 18 and the alert taxiway. The surveys of these areas are discussed in the following paragraphs, and the results of the surveys are presented in table 4.

16. Taxiways 16A and 16B. These taxiways (feature T10A), which service the south end of the runway, consist of 17-19-17-in.-thick pavement. About 3 percent of the slabs contained major defects. Every slab in this feature contained "D" cracking. The cracking had developed to the point that spalling had become a problem, and about 16 percent of the slabs had had spalls repaired (photo 1).

17. Taxiways 11A and 11B. These taxiways (feature T1A) service the north end of the runway and consist of 18-in.-thick pavement. The survey indicated that about 4 percent of the slabs contained a major

defect, and a majority of the slabs contained pop-outs. The center lane of the taxiway contained most of the major defects, and the most common defect was longitudinal cracking adjacent to the center line (photo 2). There has been a progression of this longitudinal cracking from 10 slabs in 1960 (based on the 1960 condition survey, paragraph 6) to 16 slabs in 1972. Slabs containing pop-outs have increased from 111 in 1960 to 581 in 1972.

18. Taxiways 1 and 2. These two taxiways (features T5A and T6A) are used for entrance or exit to the south end of the parking apron. The original 50-ft width of the taxiway (feature T5A) consists of an overlay pavement of 14-in.-thick PCC over the original 9-7-9-in.-thick PCC. The 25-ft widened section (feature T6A) consists of 19-in.-thick pavement. Approximately 6 percent of the slabs in the overlay pavements contained a major defect, and about 3 percent of the slabs in the 19-in.-thick section contained a major defect. Defects such as "D" cracking and pop-outs were prevalent in a large percentage of the slabs.

19. Taxiways 17 and 18. These taxiways (features T7A and T8A) are 25-in.-thick, heavy-load pavements designed for aircraft using the alert apron. The pavements did not have any major defects; however, there was evidence of "D" cracking in every slab of taxiway 17 and in about 12 percent of the slabs of taxiway 18. Water was seeping from the pavement joints in one location on both taxiways.

20. Alert taxiway. The alert taxiway (feature T9A), which consists of 24-25-24-in.-thick pavement, was free of any major defects. Approximately 5 percent of the slabs contained "D" cracking, and some spalling was observed.

21. Taxiway 12. In taxiway 12 (feature T3A), which is located at the south end of the parking apron and consists of 18-in.-thick pavement, approximately 6 percent of the slabs contained major defects. About half of the slabs in this taxiway contained pop-outs.

22. Taxiway 12A. This taxiway (feature T11A) is an overlay portion of the original N-S runway (29 slabs) and consists of 14-in.-thick pavement over the original 9-7-9-in.-thick pavement. This pavement was

in good condition, with approximately 17 percent of the slabs containing a major defect.

Parking aprons

23. The original parking apron consisted of 9-7-9-in. PCC and was overlaid with 14-in.-thick PCC. This apron was widened with uniform 17-in.-thick PCC. The widened area adjoins the old N-S runway which was also overlaid and is presently the refueling apron. The overlaid part of the apron (feature A2B) was in very good condition, with only about 2 percent of the slabs containing a major defect. However, water seeping from joints in a few locations on the apron was noted during this survey (photo 3). The predominant defects in the apron were pop-outs (photo 4) and spalls. Most of the spalls occurred in the lane adjacent to the uniform 17-in. PCC apron widening where mismatching of the transverse joints between the two pavements exists. The 17-in. pavement in the apron widening (feature A3B) was in very good condition, with only about 1 percent of the slabs containing a major defect. More than 80 percent of the slabs had pop-outs, and there was a small amount of joint spalling. The refueling apron (feature A4B) was an overlay pavement of 13-in.-thick PCC over the original 9-7-9-in.-thick PCC. This feature was generally in very good condition, with about 1 percent of the slabs containing a major defect. Some pavement distress had occurred along the joint separating the overlaid section and the uniform section where aircraft had taxied. It was reported in the 1960 survey (paragraph 6) that this distress was due to mismatched joints and to the fact that it was not possible to place the keyway of the 17-in. pavement at middepth to allow for load transfer with the overlay pavement. Some settlement and considerable spalling had been repaired in about 30 percent of the slabs in the lane adjacent to feature A3B.

24. The heavy-load-design alert apron (feature A6B) was in very good condition, with only two slabs containing a major defect. The predominant defects in this facility were pop-outs and "D" cracking. Almost 50 percent of the slabs in the apron area contained "D" cracking severe enough that spalling was occurring that will require maintenance.

Warm-up aprons

25. The north warm-up apron (feature A11B), which is 18-in.-thick pavement, was in very good condition. However, every slab contained pop-outs (photo 5), and a few slabs contained spalls. The shoulder pavements adjacent to the north warm-up apron were in fair condition, with transverse cracks and open paving joints apparent (photo 6). In the south warm-up apron (feature A10B), which is 17-in.-thick pavement, only about 4 percent of the slabs contained major defects. However, every slab had evidence of "D" cracking (photo 7), and approximately 34 percent of the slabs had spalls that had been repaired. The east warm-up apron (feature A9B), which is 18-in.-thick pavement, was in very good condition; however, every slab contained pop-outs, and a few slabs contained spalls.

Other pavements

26. The remaining pavements that were surveyed (such as the hangar apron, taxiways 4, 9A, 9B, and 10, and the calibration hardstand and taxiway) were all in very good condition, with pop-outs and spalls being the predominant defects (table 4).

Frost Action

Objectives of inspection

27. One member of the team inspected the pavement facilities for evidence of detrimental frost effects. The objectives of the inspection were to determine:

a. Any adverse effects of frost heave to the pavements during the winter months.

b. Any traffic-induced failures that might be related to thaw weakening of the subgrades or base courses.

Frost heave

28. The airfield pavements were inspected for surface irregularities indicative of differential frost heaving. The inspection, which was conducted on 10 and 11 May, was made long after the frost-melting period; therefore, evidence of nonuniform frost heave would not have

been apparent except in severe cases.

29. Personnel of the Base Civil Engineering Office were queried regarding the development of undesirable surface unevenness during the winter. Pilot testimony regarding runway unevenness was not sought, since the field has not been used by B-52 aircraft to any extent. The consensus of the survey team, however, was that the runway did not exhibit roughness detectable in an automobile at speeds of up to 60 mph. The pavement surfaces were smooth at the time of inspection and were considered to be in good to excellent condition, with no evidence of significant differential frost heaving. Base Civil Engineering Office personnel reported no undesirable surface unevenness during the winter or spring.

30. The runway overruns were smooth and showed no evidence of frost heaving. (The combined thickness of the overrun pavements is 30 in. while that of the adjacent rigid pavement at the north end of the N-S runway is only 22 in. and that at the south end is only 19 in.) Some localized areas of the flexible pavement shoulders of taxiway 17 and the alert taxiway (northeast end of the apron, see photos 8 and 9) were 1/2 to 2 in. lower than the adjacent rigid pavement. These small vertical displacements are considered to be due to settlement and subsequent repair of the shoulder pavements. These shoulder pavements also showed evidence of many patches, and numerous longitudinal and transverse cracks were observed. Such a system of transverse and longitudinal cracking in flexible pavements is typical of low-temperature contraction cracking. Water was observed flowing from several of these cracks, and the damage in these areas (18-in. combined thickness) which necessitated patching appeared to have been caused by frost action resulting from the high water table.

31. There were other areas where the shoulders showed evidence of wavelike unevenness and patching, notably along the west side of taxiway 11A, the west sides of taxiways 1 and 2, and the south side of the south warm-up apron where frost action was the probable cause of distress. Several light bases along the north side of taxiway 10 and

the west side of taxiway 11A had heaved from 1 to 2 in. above the adjacent pavement.

Freezing indices

32. A design freezing index of 380 degree-days, based on temperature data from the Sedalia Weather Station, approximately 20 miles to the east, has been determined for WAFB. This value reflects the average of the two coldest winters in the past 20 years (1961-62 and 1962-63). The value was determined with consideration to average monthly temperatures for months entirely within the freezing seasons and to average daily temperatures for the transition months at both ends of the freezing seasons.

33. The winter months in this area are characterized by warm or cold air from source regions many hundreds of miles away, since there are no natural obstructions to prevent the free sweep of air currents. Extended periods without an invasion of warm air are infrequent, with the result that large freezing index accumulations are seldom realized. Even the coldest winters considered in the design index determination included such invasions.

34. Since data are not now available to permit the determination of seasonal indices for WAFB for other than the years used in the design index computation, the seasonal values tabulated below are from the Kansas City Airport Weather Station, which is approximately 65 miles northwest of WAFB. Although these values do not reflect indices actually experienced at WAFB and, being entirely determined from average monthly temperatures, are somewhat lower than indices which consider average daily temperatures for the two transition months, they do indicate the relative severity of winters since the completion of pavements designed for heavy-load aircraft.

Freezing Season	Freezing Index degree-days	Freezing Season	Freezing Index degree-days
1956-57	198	1959-60	191
1957-58	135	1960-61	37
1958-59	167	1961-62	372

(Continued)

Freezing Season	Freezing Index degree-days	Freezing Season	Freezing Index degree-days
1962-63	378	1967-68	112
1963-64	211	1968-69	242
1964-65	19	1969-70	183
1965-66	124	1970-71	147
1966-67	0	1971-72	146
		1956-72 mean	168

Since a freezing index of design magnitude has been experienced twice since the heavy-load pavements were constructed, the general absence of evidence of differential frost heaving is significant. The combined thickness of pavement and base required for prevention of subgrade freezing in the design index year (380 degree-days) ranges from approximately 36 to 40 in. and for limited subgrade frost penetration, ranges from about 30 to 35 in., with the specific penetration being dependent on the base and subgrade density and moisture content and, to some extent, on the pavement thickness. Substantial subgrade frost penetration in colder years has occurred under the heavy-load pavements constructed during the 1953-56 period (see table 1), since their combined thickness ranges from 15 to 22 in. Any resulting frost heaving has been essentially uniform, and the present condition of these pavements indicates that it has not been a factor in pavement cracking. The combined thickness of the newer pavements (the alert apron, the alert taxiway, and taxiways 17 and 18) ranges from 33 to 36 in., and a sufficient thickness of subgrade protection to prevent the occurrence of detrimental heaving is provided in accordance with the limited subgrade frost penetration design criteria.

Groundwater

35. The water table at WAFB is reported to be approximately 120 ft below the surface, but there is definite evidence of a perched water table under portions of the pavement system. The bedrock is very deep, and the soil types in the subgrade consist of generally lean

to fat clays of CL and CH classification.* Evidence of a perched water table was found at the following pavement features during this inspection:

a. The alert taxiway, where water was observed flowing from the rigid pavement joints (northeast end of apron, see photos 8 and 9) and from the junction of the taxiway pavement (24-in. PCC over 12-in. crushed stone) and the shoulder (2-in. AC over 16-in. crushed stone).

b. Taxiway 17, where water was observed flowing from the rigid pavement joints, from cracks in the flexible shoulder pavement, from under the shoulders, and from around a light fixture.

c. The shoulder along the west side of taxiway 11A, where water was observed flowing from the exposed base course at the edge of the shoulder.

Subdrains reportedly were installed to control bleeding joints along portions of the north end of the alert apron, taxiways 11A, 11B, 16A, 16B, and 17, and the south side of the south warm-up apron.

Thaw weakening

36. The extent of thaw weakening of the subgrades and base courses could not be readily determined by inspection of the pavements. Pavement failures usually are repaired or otherwise corrected soon after they occur and consequently are not easily examined during a condition survey. However, even when an examination can be made, it is seldom possible to determine whether the failure resulted from thaw weakening or from pavement design deficiencies with respect to the "normal" period subsoil and traffic conditions. The depletion of the fatigue resistance of a pavement system is progressive under repeated loadings and in a frost area is related to thaw weakening in that the rate of depletion is greater during the frost-melting period. This rate of depletion holds true whether the evidence of fatigue becomes apparent during the melting period or at some other time. The degree of thaw weakening and its

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* U. S. Department of Defense, "Unified Soil Classification System for Roads, Airfields, Embankments, and Foundations," Military Standard MIL-STD-619B, June 1968, U. S. Government Printing Office, Washington, D. C.

effects, if any, on the condition of the pavements at WAFB consequently could not be appraised solely by this inspection. Some limited perception of the severity of thaw weakening effects can be gained, however, by comparing the performance of certain pavement features with what might be expected in the light of current frost design criteria.

37. There are no heavy-load flexible pavements at WAFB. The only flexible pavements are the shoulders, blast areas, and overruns. The combined thickness of each shoulder pavement ranges from 15 to 18 in. and, assuming a CBR value representative of the typical subgrade, is adequate in accordance with the current normal (nonfrost) period design criteria. An 18-in. combined thickness would be required under current criteria for reduced subgrade strength conditions during and following the frost-melting period. The shoulders were in good condition and relatively free of evidence of detrimental frost effects, with the exception of the localized areas described in paragraphs 30 and 31. The overruns have a combined thickness of 30 in., which, again assuming a representative subgrade CBR, is adequate in accordance with the current normal (nonfrost) period design criteria and is essentially adequate in accordance with limited subgrade frost penetration design criteria. The overruns were in excellent condition.

38. The alert apron and taxiway (features A6B and T9A), taxiway 17 (feature T7A), and taxiway 18 (feature T8A) conform to the current heavy-load design criteria (265,000-lb gear loads). The 33- to 36-in. combined thickness of pavement and base course incorporated in these features is also adequate in accordance with the limited subgrade frost penetration design criteria which assume no reduction in pavement bearing capacity for frost-condition operation. These pavements have not been subjected to the design traffic load to any extent, and only two major defects were observed (both on feature A6B, which has a 33-in. combined thickness).

39. The heavy-load pavements constructed or reconstructed during the 1953-56 period (table 1) were designed for a 100,000-lb, dual-wheel load. Since the combined pavement and base course thicknesses of these features (15 to 22 in.) are not adequate with respect to the limited subgrade frost penetration design criteria, performance must be compared

with reduced subgrade strength design and evaluation criteria. This design method specifies that rigid pavement slab thickness must be determined on the basis of the frost-melting period subgrade modulus k_f and, for the low design freezing index and uniform subgrade conditions at WAFB, that a 4-in. minimum thickness of nonfrost-susceptible base course must be employed. The slab thicknesses are adequate for frost-condition operation of the design gear load; however, some of the pavements were placed directly on the subgrade. The principal heavy aircraft using WAFB (B-47's, C-141's, KC-97's, and KC-135's, see paragraphs 9-12 and table 3) have not overloaded the pavements during the frost-melting period, and the small number of observed major structural defects (paragraphs 14-26) indicates that thaw weakening has not been a significant factor in pavement performance.

40. Essentially no B-52 traffic has been reported; however, operation of this aircraft would grossly overload most of the pavements cited in paragraph 39, even for nonfrost-condition operation.

Maintenance

41. Maintenance at WAFB has consisted of crack sealing, joint resealing, slurry sealing shoulder pavements, repairing pop-outs and spalls, and replacing slabs. Over the years, maintenance work by the Base Civil Engineering work force has been limited to such emergency repairs as repairing severe spalls and pop-outs on active pavements. Some joint resealing has been accomplished; however, the major portion of the maintenance has been accomplished on random cracks in the shoulder stabilization. A history of the contract maintenance and costs is presented below:

a. November-December 1957. Joints were cleaned and resealed in all pavements except the alert apron, the primary runway extension, and taxiway 16. Joint seal materials SS-S-164 and SS-S-167 were used. Cost was $105,306.

b. June-October 1961. Pop-outs and spalls were repaired using epoxy concrete and mortar. Cost was $42,688.

c. March-October 1962. Joints were cleaned and resealed in

all pavements except the parking apron and alert apron. Partial slab replacements and spall repairs were completed using PCC with epoxy bonding agent. Joint seal materials SS-S-200a and SS-S-164 were used. Cost was $147,698.

d. July-August 1962. Emergency repairs of spalled concrete resulting from aircraft fire were accomplished. A thin bonded overlay of PCC was placed on 10 slabs. Cost was $11,445.

e. August-October 1964. Joints were cleaned and resealed on the parking apron. Joint seal material SS-S-200a was used. Cost was $13,038.

f. June-August 1965. Hangar access pavement was overlaid with hot-mix bituminous material.

g. July-November 1965. Spalled concrete on the runway and taxiways was repaired with cold-mix bituminous material overlaid with joint seal material SS-S-164. Twenty percent of the bituminous shoulder stabilization was slurry sealed. Cost was $71,297.

h. July-September 1966. Eighty percent of the bituminous shoulder stabilization was slurry sealed. Cost was $21,994.

i. March-June 1969. Spalls and pop-outs on primary runway and taxiways were repaired with PCC and epoxy bonding agent. Cost was $23,182.

42. Based on the 1972 survey, pop-outs and spalling along joints constitute the major maintenance problems at WAFB. Pop-outs were found in most of the pavement features, as is indicated in table 4, with especially high concentrations observed in the parking apron. "D" cracking was prevalent at several locations and constituted a serious problem on the south end of the alert apron, taxiways 1, 2, 16A, and 16B, the south end of the runway, and the south warm-up apron where cracking had progressed (or soon will progress) to the point that scaling and spalling will occur. The spalls have been patched with epoxy and mortar, bituminous cold mix, or PCC with epoxy bonding. In some cases, they have been sealed with joint seal material (photos 10 and 11).

43. The joint seal material generally was in fair condition; however, there were some areas where the seal was in poor condition and water seepage was noted at the joints.

Evaluation

44. The latest evaluation report for this airfield was prepared in 1960 (see paragraph 6). Because some changes in gear configurations and methods of evaluation have been made since that time, a new evaluation table (table 5) has been prepared. The physical properties of the materials as determined in previous evaluations were used for this evaluation with engineering judgment applied to specific pavement areas where performance has indicated that the load-carrying capacity should be modified from that obtained in using the strength properties assigned in the physical property data.

Conclusions

45. The following remarks summarize the findings of the 1972 inspection:

a. Pop-outs, which were one of the predominant defects observed, were continuing to develop and constituted an operational hazard.

b. Longitudinal cracking on taxiways 11A and 11B had progressed since the last condition survey in 1960.

c. "D" cracking was prevalent in every pavement constructed during 1956 and 1959 and was a serious problem in these pavements. Some "D" cracking was occurring in the pavements of taxiways 1 and 2, which were constructed in 1953.

d. The spalling that had occurred on the refueling and parking aprons is due to the mismatching of the transverse joints between the two pavements.

e. Joint seals, in general, were in fair to poor condition.

f. Keyed joint failures along the center line of the N-S runway extension (15-in. PCC) had progressed since the 1960 survey.

g. B-47 aircraft operated at this field until August 1963. Predominant aircraft operating on the pavements at the time of this survey were C-141's and KC-135's. The pavements appeared to be performing satisfactorily (structurally) from operations of these aircraft.

h. While freezing conditions of design index magnitude have been experienced in recent years at WAFB that undoubtedly have caused freezing of subgrade soils (classified as highly frost susceptible) under some pavement features, no evidence of either detrimental frost heave or of significant pavement failure due to thaw weakening of the subgrade was apparent.

Table 1

Airfield Construction History

Pavement Facility	Dimensions Length ft	Dimensions Width ft	Pavement Thickness in.	Pavement Type	Construction Year	Construction Agency
NE-SW runway (abandoned)	7,200	150	9-7-9	PCC	1942	CE
NW-SE runway (abandoned)	7,200	150	9-7-9	PCC	1942	CE
E-W runway (closed)	7,200	150	9-7-9	PCC	1942	CE
Taxiways 3, 5, 6, 7A, 7B, 7C, and 8 (abandoned)	Varies	50	9-7-9	PCC	1942	CE
Refueling apron (formerly N-S runway)	7,200	150	9-7-9	PCC	1942	CE
Refueling apron	6,100±	150	13	PCC*	1954	CE
Taxiways 1, 2, and 4	Varies	50	9-7-9	PCC	1942	CE
Taxiways 1, 2, and 4	Varies	50	14	PCC*	1953	CE
Taxiways 1 and 2	Varies	25	19	PCC**	1953	CE
Parking apron	3,750	600	9-7-9	PCC	1942	CE
Parking apron	412	600	9-7-9	PCC†	1942	CE
Parking apron	4,160±	550	14	PCC*	1953	CE
Parking apron	4,800±	425	17	PCC**	1954	CE
N-S runway ends	2,000	200	18	PCC	1953	CE
N-S runway interior	8,000	200	16	PCC	1953	CE
N-S runway	1,400	200	15	PCC†	1956	CE
N-S runway	500	200	17	PCC†	1956	CE
N-S runway	500	200	19	PCC†	1956	CE
Taxiways 9A, 9B, 10, 11A, 11B, and 12	Varies	75	18	PCC	1953	CE
North warm-up apron	550	200	18	PCC	1953	CE
East warm-up apron	525	275	18	PCC	1953	CE
Hangar apron	Varies	Varies	18	PCC	1953	CE
North hangar apron	200	125	15	PCC	1955	CE
Washrack	170	145	15	PCC	1955	CE
North hangar apron taxiway	600	75	17	PCC	1955	CE
Calibration hardstand (250-ft diameter)			17	PCC	1955	CE
Calibration hardstand taxiway	450±	75	17	PCC	1955	CE
Taxiways 16A and 16B	Varies	75	17-19-17	PCC	1956	CE
South warm-up apron	Varies	Varies	17	PCC	1956	CE
Alert apron	2,540	158	19	PCC	1959	CE
Alert taxiway	2,540	75	24-25-24	PCC	1959	CE
Taxiways 17 and 18	800+	75	25	PCC	1959	CE

Notes: CE denotes Corps of Engineers. Pavements constructed during 1953-1956 were designed for 100,000-lb loadings; pavements constructed during 1959 were designed for 265,000-lb loadings.

* Overlay.

** Widening.

† Extension.

Table

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY				OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA CONSIDERED
FACILITY NUMBER AND IDENTIFICATION		LENGTH FT	WIDTH FT	THICK. IN.	DESCRIPTION	FLEX. STR PSI	THICK. IN.	DESCRIPTION	FLEX. STR PSI	THICK. IN.	CLASSIFICATION	CBR OR K	CLASSIFICATION	CBR OR K	
R1A R2B	N-S runway; 1st 1000 ft, N end	1,000	200				18	Portland cement concrete	720	4	Crushed stone	75 k_y=25	Clay (CL-CH)		Excellent
R3C R4C	N-S runway interior	8,000 1,000±	200 200				16 18	Portland cement concrete	720	4	Crushed stone	75 k_y=25	Clay (CL-CH)		Excellent
R5C	N-S runway interior	1,400±	200				15	Portland cement concrete	720				Clay (CL-CH)	75 k_y=25	Good
R6B	N-S runway; 2nd 500 ft, S end	500	200				17	Portland cement concrete	720				Clay (CL-CH)	75 k_y=25	Very good
R7A	N-S runway; 1st 500 ft, S end	500	200				19	Portland cement concrete	720				Clay (CL-CH)	75 k_y=25	Very good
T1A	Taxiways 11A and 11B	5,150	75				18	Portland cement concrete	720	4	Crushed stone	75 k_y=25	Clay (CL-CH)		Very good
T3A	Taxiway 12	425±	75												
T2C	Taxiways 9A and 9B	6,125±	75												
T4C	Taxiway 10	2,600	75												
T5A	Taxiways 1 and 2	2,150	50	14	Portland cement concrete h_E = 16.6	720	7	Portland cement concrete (9-7-9)					Clay (CL-CH)	40 k_y=25	Good
T6A	Taxiways 1 and 2 (widening)	2,150	25				19	Portland cement concrete	720	4	Crushed stone	75 k_y=25	Clay (CL-CH)		Very good
T7A	Taxiway 17	800±	75				25	Portland cement concrete	780	11	Crushed stone	165 k_y=65	Clay (CL-CH)		Very good
T8A	Taxiway 18														
T9A	Alert taxiway	2,540	75				25	Portland cement concrete (24-25-24)	780	11	Crushed stone	165 k_y=65	Clay (CL-CH)		Very good
T10A	Taxiways 16A and 16B	Variable	75				19	Portland cement concrete (17-19-17)	720				Clay (CL-CH)	75 k_y=25	Good
T11A	Taxiway 12B	200±	75	14	Portland cement concrete h_E = 16.6	720	7	Portland cement concrete (9-7-9)					Clay (CL-CH)	40 k_y=25	Good
T13C	Taxiway 4	1,000±	50				7	Portland cement concrete (9-7-9)	900				Lean clay (CL)	40 k_y=25	Very good
T14B	North hangar apron taxiway	600	75				17	Portland cement concrete	720				Clay (CL-CH)	75 k_y=25	Good

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Table 2 (Continued)

SUMMARY OF PHYSICAL PROPERTY DATA

FACILITY				OVERLAY PAVEMENT			PAVEMENT			BASE			SUBGRADE		GENERAL CONDITION OF AREA CONSIDERED
FACILITY NUMBER AND IDENTIFICATION		LENGTH FT	WIDTH FT	THICK. IN.	DESCRIPTION	FLEX. STR PSI	THICK. IN.	DESCRIPTION	FLEX. STR PSI	THICK. IN.	CLASSIFICATION	CBR OR K	CLASSIFICATION	CBR OR K	
A2B	Parking apron	4,160±	550	14	Portland cement concrete h_E = 16.6	720	7	Portland cement concrete (9-7-9)					Clay (CL-CH)	40 k_r=25	Very good
A3B	Parking apron (widening)	4,800±	425				17	Portland cement concrete	720				Clay (CL-CH)	75 k_r=25	Very good
A4B	Refueling apron (originally N-S runway) N-W end of original NW-SE runway	6,100± 400	150 150	13	Portland cement concrete h_E = 15.7	720	7	Portland cement concrete (9-7-9)					Clay (CL-CH)	40 k_r=25	Very good Good
A5B	Hangar apron	Irregular	Irregular				18	Portland cement concrete	720	4	Crushed stone	75 k_r=25	Clay (CL-CH)		Very good
A1B	North hangar apron	200	125				15	Portland cement concrete	720				Clay (CL-CH)	75 k_r=25	--
A6B	Alert apron	2,540	158				19	Portland cement concrete	780	14	Crushed stone	190 k_r=80	Clay (CL-CH)		Very good
A7C	Calibration hardstand (250-ft diameter) Calibration hardstand taxiway	450±	75				17	Portland cement concrete	720				Clay (CL-CH)	75 k_r=25	Very good
A8B	Washrack	170	145				15	Portland cement concrete	720				Clay (CL-CH)	75 k_r=25	--
A11B	North warm-up apron	550	200				18	Portland cement concrete	720	4	Crushed stone	75 k_r=25	Clay (CL-CH)		Very good
A9B	East warm-up apron	525	275												
A10B	South warm-up apron	Variable	Variable				17	Portland cement concrete	720				Clay (CL-CH)	75 k_r=25	Good

Table 3

Traffic Record for 1968-1971

	Cycles of Operation per Loading Category			
Year	A 30,000 lb or less	B 30,001 to 60,000 lb	C 60,001 to 150,000 lb	D over 150,000 lb
1968	6,304	9,984	11,116	5,018
1969	3,396	5,734	6,565	3,003
1970	4,695	6,112	7,695	4,416
1971	5,593	11,744	11,744	4,479

Note: The above landings and takeoffs include touch-and-go operations. Aircraft cycles in category D (over 150,000 lb) were applied as follows: 60 percent, C-141's; 35 percent, KC-135's; and 5 percent, L-188's (Logair cargo aircraft).

Table 4

DATE: May 1972

SUMMARY OF DATA - RIGID PAVEMENT CONDITION SURVEY

AIRFIELD: Whiteman AFB

FEATURE NO.	FEATURE DESIGNATION	SLAB SIZE FT	APPROX NO. OF SLABS	PAVE. THICK. IN.	NO. OF SLABS CONTAINING INDICATED DEFECTS																	% OF SLABS NO DEFECTS	% OF SLABS NO MAJOR DEFECTS	CONDITION
					I	—	\	Δ	*	K	~	S	J	↓	J	⊕	M	P	O	C	D			
01A	1-8 runway; 1st 500 ft, N end	25 by 25	160	18			2				1		1						23			* 84	99	Excellent
01B	1-8 runway; 2nd 500 ft, N end	25 by 25	160	18									1	1	1							98	100	Excellent
01C	1-8 runway interior	25 by 25	2560	16			3	1	1		11		21	10	17				28			96	99	Excellent
08C	8-8 runway interior	25 by 25	320	18							1		1	2	4				2			97	100	Excellent
35C	35-8 runway interior	25 by 25	448	15	36	17	18	1	1	40	1			1	4					1	330	15	82	Good
36B	36-8 runway; 2nd 500 ft, S end	25 by 25	160	17			1								1						160	0	99	Very good
07A	1-8 runway; 1st 500 ft, S end	25 by 25	160	19			1													1	91	43	99	Very good
11A	Taxiways 11A and 11B	25 by 25	615	18	18	2	3	1			2	1	5	3	0				501	3	1	6	96	Very good
10A	Taxiways 10A and 10B	25 by 25	308	17-19-17	6	3	3				1	2	1		1				2	1	288	0	97	Good
15A	Taxiways 1 and 2	25 by 25	810	19/-/-/-	6	4	1	1						1	2				39		50	33	94	Good

REMARKS:

LEGEND:

I	LONGITUDINAL CRACK	~	SHRINKAGE CRACK	M	MAP CRACKING
—	TRANSVERSE CRACK	S	SCALING	P	PUMPING JOINT
\	DIAGONAL CRACK	J	SPALL ON TRANSVERSE JOINT	O	POP-OUT
Δ	CORNER BREAK	↓	SPALL ON LONGITUDINAL JOINT	C	UNCONTROLLED CONTRACTION CRACK
*	SHATTERED SLAB	J	CORNER SPALL	D	"D" CRACKING
K	KEYED JOINT FAILURE	⊕	SETTLEMENT		

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Table 4 (Continued)

DATE: May 1970

SUMMARY OF DATA - RIGID PAVEMENT CONDITION SURVEY

AIRFIELD: Whiteman AFB

FEATURE NO	FEATURE DESIGNATION	SLAB SIZE FT	APPROX NO. OF SLABS	PAVE THICK IN.	NO. OF SLABS CONTAINING INDICATED DEFECTS																	% OF SLABS NO DEFECTS	% OF SLABS NO MAJOR DEFECTS	CONDITION
					I	—	\	Δ	*	K	~	S	J	↓	J	⊕	M	P	O	C	D			
T6A	Taxiways 1 and 2 (widening)	25 by 25	106	19	1		1	1											12	1	29	50	97	Very good
T11A	Taxiway 12A	25 by 25	29	14/9-7-9	1	2	1	1			1					1						76	83	Good
T3A	Taxiway 12	25 by 25	66	18			2	2							1				30			48	94	Very good
T7A	Taxiway 17	25 by 25	55	25											1				1		55	0	100	Very good
T8A	Taxiway 18	25 by 25	86	25																	10	88	100	Very good
T9A	Alert taxiway	25 by 25	309	24-25-24											7				4		59	80	100	Very good
A6B	Alert apron	25 by 25	721	19			1	1			1				17				215		420	15	99	Very good
A2B	Parking apron	25 by 25	4474	14/9-7-9	16	67	5	11	1		28	11	4	14	56				3370	8	3	24	98	Very good
A3B	Parking apron (widening)	25 by 25	3159	17	17	5	1	5	1		5	1	8	10	29	2			2651	1	11	15	99	Very good
A4B	Refueling apron	20 by 25	1882	13/9-7-9	10	3	4	3			4		19	13	47	2			1053			45	99	Very good

REMARKS:

LEGEND:

I	LONGITUDINAL CRACK	~	SHRINKAGE CRACK	M	MAP CRACKING
—	TRANSVERSE CRACK	S	SCALING	P	PUMPING JOINT
\	DIAGONAL CRACK	J	SPALL ON TRANSVERSE JOINT	O	POP-OUT
Δ	CORNER BREAK	↓	SPALL ON LONGITUDINAL JOINT	C	UNCONTROLLED CONTRACTION CRACK
*	SHATTERED SLAB	J	CORNER SPALL	D	"D" CRACKING
K	KEYED JOINT FAILURE	⊕	SETTLEMENT		

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Table 4 (Continued)

DATE: May 1972

SUMMARY OF DATA - RIGID PAVEMENT CONDITION SURVEY

AIRFIELD: Whiteman AFB

FEATURE NO.	FEATURE DESIGNATION	SLAB SIZE FT	APPROX NO. OF SLABS	PAVE. THICK. IN.	NO. OF SLABS CONTAINING INDICATED DEFECTS																	% OF SLABS NO DEFECTS	% OF SLABS NO MAJOR DEFECTS	CONDITION
					I	—	\	Δ	*	K	~	S	J	↓	J	⊕	M	P	O	C	D			
A4B	NW end of original NW-SE runway	20 by 25	161	13/9-7-9	19	3	1	1	1		3		5		7				55			51	84	Good
A11B	North warm-up apron	25 by 25	166	18							1			1	2				166			0	100	Very good
A10B	South warm-up apron	25 by 25	119	17			4	3							1						119	0	96	Good
A9B	East warm-up apron	25 by 25	190	18									1		7				190	3		0	100	Very good
A5B	Hangar apron	25 by 25	312	18	2	1							1	3	3	7			78			72	99	Very good
T4C	Taxiway 10	25 by 25	318	18	1	1	1				5		1						265	8		10	90	Very good
T5C	Taxiway 9A	25 by 25	229	18		6	1	1											4			95	96	Very good
T2C	Taxiway 9B	25 by 25	490	18	1		1				1		1	2	2				68			55	99	Very good
T13C	Taxiway 4	20 by 25	68	14/9-7-9				1											66			0	99	Very good
A7C	Calibration hardstand and taxiway	25 by 25	180	17	1									1					116			34	99	Very good

REMARKS:

LEGEND:

I	LONGITUDINAL CRACK	~	SHRINKAGE CRACK	M	MAP CRACKING
—	TRANSVERSE CRACK	S	SCALING	P	PUMPING JOINT
\	DIAGONAL CRACK	J	SPALL ON TRANSVERSE JOINT	O	POP-OUT
Δ	CORNER BREAK	↓	SPALL ON LONGITUDINAL JOINT	C	UNCONTROLLED CONTRACTION CRACK
*	SHATTERED SLAB	J	CORNER SPALL	D	"D" CRACKING
K	KEYED JOINT FAILURE	⊕	SETTLEMENT		

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JUN 1972

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Table 5

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Whiteman AFB

DATE OF EVALUATION: MONTH: May YR: 1972

FEATURE NO.	FEATURE DESIGNATION	PAVEMENT OPERATIONAL USE	LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS										REMARKS
			TRICYCLE ARRANGEMENT									BICYCLE	
			SINGLE 100-PSI TIRE PRESSURE	SINGLE 100-SQ-IN. CONTACT AREA	SINGLE 241-SQ-IN. CONTACT AREA	TW 28-IN. C-C 226-SQ-IN. CONTACT AREA EACH TIRE	SINGLE TANDEM 60-IN. SPACING 400-SQ-IN. CONTACT AREA	TW 37-IN. C-C 267-SQ-IN CONTACT AREA EACH TIRE	TW 44-IN. C-C 630-SQ-IN. CONTACT AREA EACH TIRE	TWIN TANDEM 33 IN. × 40 IN. 206-SQ-IN. CONTACT AREA EACH TIRE	C-5A GEAR CONFIGURATION	TWIN TWIN SPCG 37-62-37 267-SQ-IN. CONTACT AREA EACH TIRE	
			1	2	3	4	5	6	7	8	9	10	
R1A	N-S runway 1st 500 ft N end	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	220,000	230,000+	350,000	800,000+	320,000	
		Frost capacity	155,000+	85,000+	155,000+	205,000	200,000+	220,000	230,000+	330,000	800,000+	275,000	
R2B	N-S runway 2nd 500 ft N end	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	260,000	230,000+	380,000+	800,000+	340,000	
		Frost capacity	155,000+	85,000+	155,000+	205,000	200,000+	220,000	230,000+	330,000	800,000+	275,000	
R3C	N-S runway interior, sta 89+87.38 to sta 9+87.38	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	285,000	230,000+	380,000+	800,000+	370,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	245,000	230,000+	370,000	800,000+	310,000	
R4C	N-S runway interior, sta 9+87.38 to sta 0+37.69	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	450,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	290,000	230,000+	380,000+	800,000+	360,000	
R5C	N-S runway interior, sta 0+37.69 to sta 14+12.62	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	260,000	230,000+	380,000+	800,000+	340,000	
		Frost capacity	155,000	85,000+	155,000+	205,000	200,000+	225,000	230,000+	350,000	800,000+	285,000	
R6B	N-S runway 2nd 500 ft S end	Capacity	155,000+	85,000+	155,000+	215,000	200,000+	240,000	230,000+	380,000+	800,000+	310,000	
		Frost capacity	145,000	85,000+	155,000+	185,000	200,000+	205,000	230,000+	310,000	800,000+	255,000	
R7A	N-S runway 1st 500 ft S end	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	230,000	230,000+	370,000	800,000+	330,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	230,000	230,000+	350,000	800,000+	310,000	
T1A	Taxiways 11A and 11B	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	220,000	230,000+	350,000	800,000+	320,000	
		Frost capacity	155,000+	85,000+	155,000+	205,000	200,000+	220,000	230,000+	330,000	800,000+	275,000	
T4C	Taxiway 10	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000	230,000+	380,000+	800,000+	450,000	
T2C	Taxiways 9A and 9B	Frost capacity	155,000+	85,000+	155,000+	220,000	200,000+	290,000	230,000+	380,000+	800,000+	360,000	
T3A	Taxiway 12	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	220,000	230,000+	350,000	800,000+	320,000	
		Frost capacity	155,000+	85,000+	155,000+	205,000	200,000+	220,000	230,000+	330,000	800,000+	275,000	

Note: + sign denotes allowable gross loading greater than maximum gross weight of any existing aircraft having indicated gear configuration.
(a) denotes allowable gross loading less than minimum gross weight of any existing aircraft having indicated gear configuration.

Table 5 (Continued)

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Whiteman AFB DATE OF EVALUATION MONTH: May YR: 1972			LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS										
			TRICYCLE ARRANGEMENT									BICYCLE	
FEATURE		PAVEMENT OPERATIONAL USE	SINGLE 100-PSI TIRE PRESSURE	SINGLE 100-SQ-IN. CONTACT AREA	SINGLE 241-SQ-IN. CONTACT AREA	TW 28-IN. C-C 226-SQ-IN. CONTACT AREA EACH TIRE	SINGLE TANDEM 60-IN. SPACING 400-SQ-IN. CONTACT AREA	TW 37-IN. C-C 267-SQ-IN. CONTACT AREA EACH TIRE	TW 44-IN. C-C 630-SQ-IN. CONTACT AREA EACH TIRE	TWIN TANDEM 33-IN. × 48-IN. 208-SQ-IN. CONTACT AREA EACH TIRE	C-5A GEAR CONFIGURATION	TWIN TWIN SPCG 37-62-37 267-SQ-IN. CONTACT AREA EACH TIRE	REMARKS
NO.	DESIGNATION		1	2	3	4	5	6	7	8	9	10	
T5A	Taxiways 1 and 2	Capacity	140,000	85,000+	155,000+	190,000	200,000+	175,000	220,000	275,000	800,000+	250,000	
		Frost capacity	140,000	85,000+	155,000+	185,000	200,000+	175,000	220,000	275,000	800,000+	250,000	
T6A	Taxiways 1 and 2 (widening)	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	230,000	230,000+	370,000	800,000+	330,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	230,000	230,000+	350,000	800,000+	310,000	
T7A T8A	Taxiway 17 Taxiway 18	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
T9A	Alert taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	600,000+	
T10A	Taxiways 16A and 16B	Capacity	155,000	85,000+	155,000+	220,000+	200,000+	230,000	230,000+	370,000	800,000+	330,000	
		Frost capacity	155,000	85,000+	155,000+	220,000+	200,000+	230,000	230,000+	350,000	800,000+	310,000	
T11A	Taxiway 12A	Capacity	140,000	85,000+	155,000+	190,000	200,000+	175,000	220,000	275,000	800,000+	250,000	
		Frost capacity	140,000	85,000+	155,000+	185,000	200,000+	175,000	220,000	275,000	800,000+	250,000	
T13C	Taxiway 4	Capacity	60,000	50,000	80,000	90,000	135,000	100,000	130,000	180,000	540,000	(a)	
		Frost capacity	60,000	45,000	85,000	85,000	130,000	95,000	120,000	170,000	500,000	(a)	
T14B	North hangar apron taxiway	Capacity	155,000+	85,000+	155,000+	215,000	200,000+	240,000	230,000+	380,000+	800,000+	310,000	
		Frost capacity	145,000	85,000+	155,000	185,000	200,000+	203,000	230,000+	310,000	800,000+	255,000	
A2B	Parking apron	Capacity	140,000	85,000+	155,000+	190,000	200,000+	205,000	230,000+	320,000	800,000+	260,000	
		Frost capacity	135,000	85,000+	155,000+	180,000	200,000+	195,000	230,000+	290,000	800,000+	240,000	
A3B	Parking apron (widening)	Capacity	155,000+	85,000+	155,000+	215,000	200,000+	240,000	230,000+	380,000+	800,000+	310,000	
		Frost capacity	145,000	85,000+	155,000+	185,000	200,000+	203,000	230,000+	310,000	800,000+	255,000	
A4B	Refueling apron (originally N-S runway) and NW end of original NW-SE runway	Capacity	130,000	85,000	155,000+	175,000	200,000+	195,000	230,000+	315,000	800,000+	250,000	
		Frost capacity	125,000	85,000+	155,000+	165,000	200,000+	175,000	215,000	270,000	800,000+	215,000	
A5B	Hangar apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	260,000	230,000+	380,000+	800,000+	340,000	
		Frost capacity	155,000+	85,000+	155,000+	205,000	200,000+	220,000	230,000+	330,000	800,000+	275,000	

WES FORM NO. 999 EDITION OF AUG 1960 IS OBSOLETE.
JUNE 1972

(2 of 3 sheets)

Table 5 (Continued)

SUMMARY OF PAVEMENT EVALUATION

NAME OF AIRFIELD: Whiteman AFB DATE OF EVALUATION MONTH: May YR: 1972			LOAD-CARRYING CAPACITY IN LB OF GROSS PLANE LOAD FOR INDICATED LANDING GEAR TYPES AND CONFIGURATIONS										
			TRICYCLE ARRANGEMENT									BICYCLE	
FEATURE		PAVEMENT OPERATIONAL USE	SINGLE 100-PSI TIRE PRESSURE	SINGLE 100-SQ-IN. CONTACT AREA	SINGLE 241-SQ-IN. CONTACT AREA	TW 28-IN. C-C 226-SQ-IN. CONTACT AREA EACH TIRE	SINGLE TANDEM 60-IN. SPACING 400-SQ-IN. CONTACT AREA	TW 37-IN. C-C 267-SQ-IN. CONTACT AREA EACH TIRE	TW 46-IN. C-C 630-SQ-IN. CONTACT AREA EACH TIRE	TWIN TANDEM 33 IN. × 48 IN. 208-SQ-IN. CONTACT AREA EACH TIRE	C-5A GEAR CONFIGURATION	TWIN TWIN SPCG 37-62-37 267-SQ-IN. CONTACT AREA EACH TIRE	REMARKS
NO.	DESIGNATION		1	2	3	4	5	6	7	8	9	10	
A1B	North hangar apron	Capacity	125,000	85,000+	155,000+	175,000	200,000+	195,000	230,000+	320,000	800,000+	250,000	
		Frost capacity	115,000	85,000+	155,000	155,000	200,000+	170,000	205,000	260,000	750,000	(a)	
A6B	Alert apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	330,000+	230,000+	380,000+	800,000+	480,000	
A7C	Calibration hardstand and taxiway	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	320,000	230,000+	380,000+	800,000+	410,000	
		Frost capacity	155,000+	85,000+	155,000+	220,000+	200,000+	270,000	230,000+	380,000+	800,000+	340,000	
A8B	Washrack	Capacity	125,000	85,000+	155,000+	175,000	200,000+	195,000	230,000+	320,000	800,000+	250,000	
		Frost capacity	115,000	85,000+	155,000	155,000	200,000+	170,000	205,000	260,000	750,000	(a)	
A11B	North warm-up apron	Capacity	155,000+	85,000+	155,000+	220,000+	200,000+	260,000	230,000+	380,000+	800,000+	340,000	
		Frost capacity	155,000+	85,000+	155,000+	205,000	200,000+	220,000	230,000+	330,000	800,000+	275,000	
A9B	East warm-up apron												
A10B	South warm-up apron	Capacity	155,000+	85,000+	155,000+	215,000	200,000+	240,000	230,000+	380,000+	800,000+	310,000	
		Frost capacity	145,000	85,000+	155,000+	185,000	200,000+	205,000	230,000+	310,000	800,000+	255,000	

WES FORM NO. 999 (JUNE 1972) EDITION OF AUG 1960 IS OBSOLETE.

(3 of 3 sheets)

Photo 1. "D" cracking and corner spall repair on taxiway 16A

Photo 2. Patched longitudinal crack on taxiway 11A

Photo 3. Water seepage through joints in apron

Photo 4. Pop-out on apron area

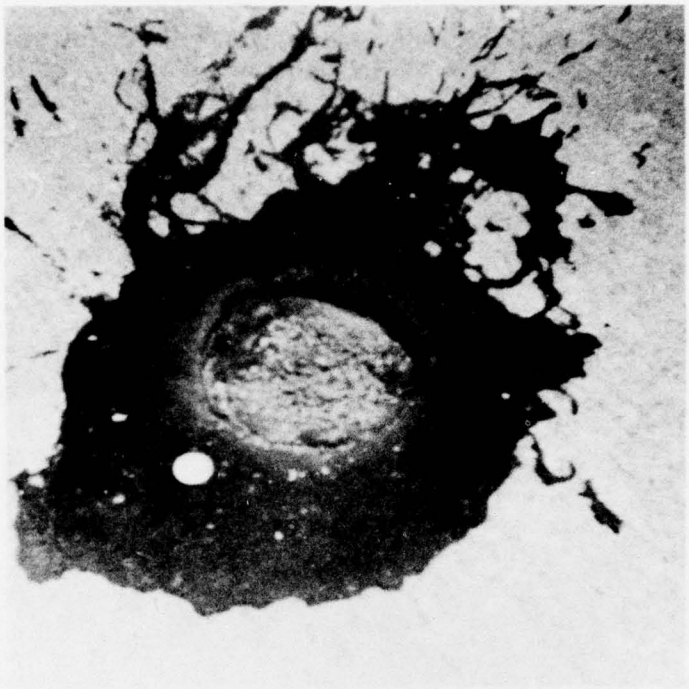


Photo 5. Repaired pop-out on north warm-up apron

Photo 6. Condition of shoulder area adjacent to north warm-up apron

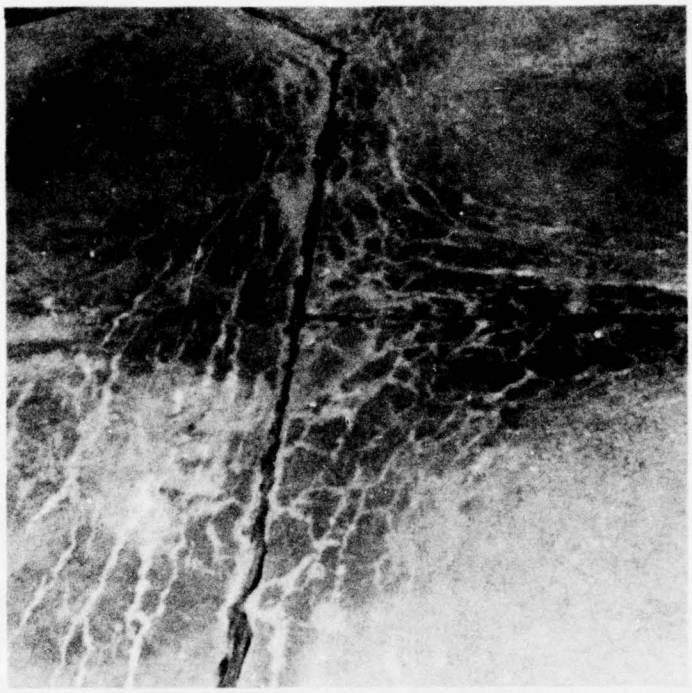


Photo 7. Severity of "D" cracking on south warm-up apron

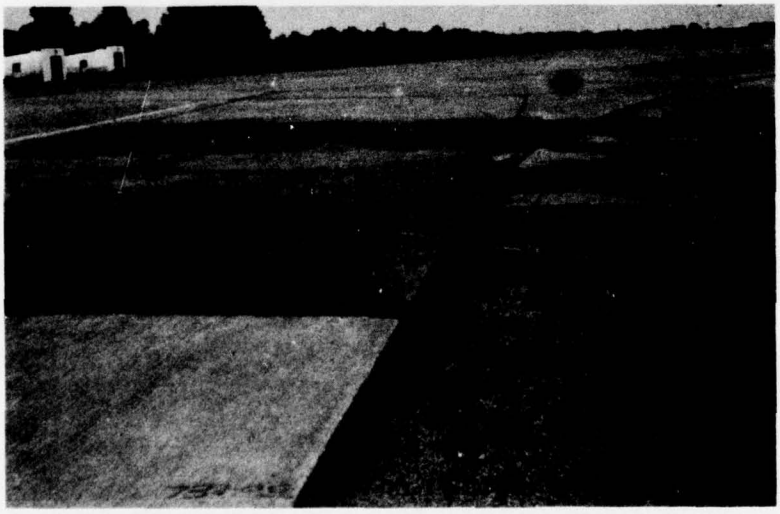


Photo 8. Alert taxiway; note water stains from seepage through pavement joints

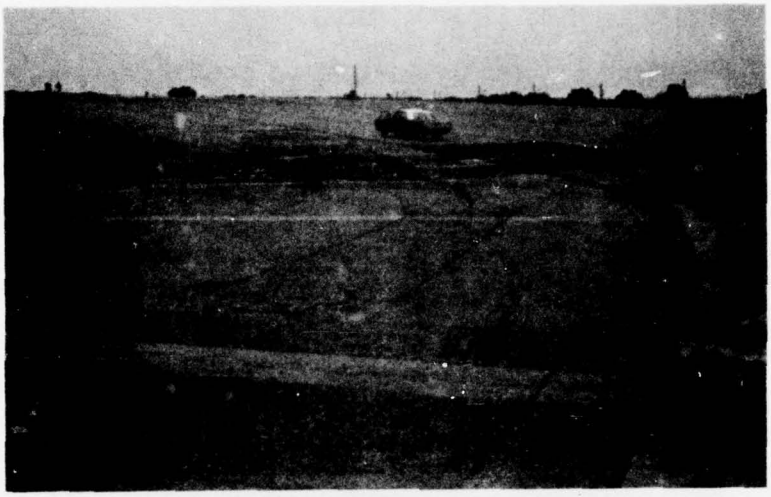


Photo 9. Alert taxiway and shoulder pavements at northeast end of apron shoulders approximately 1/2 to 2 in. lower than PCC pavement

Photo 10. Scaling along joints from "D" cracking

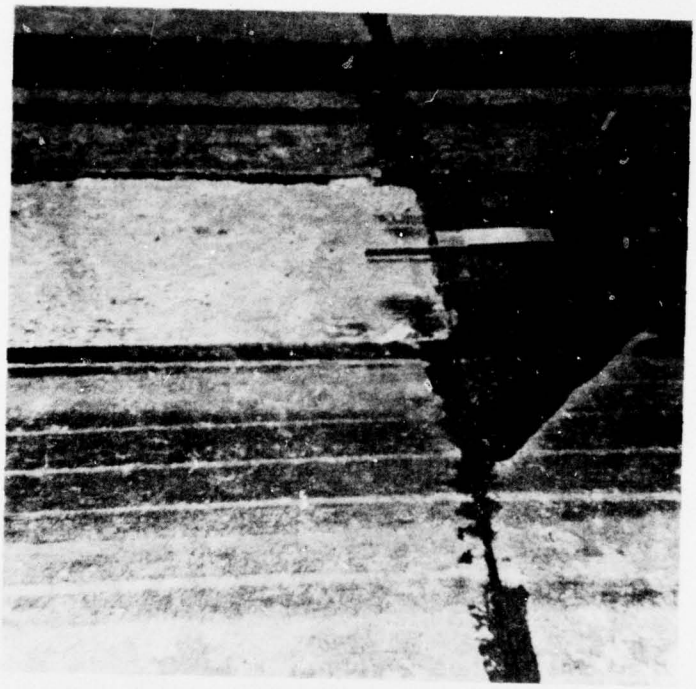
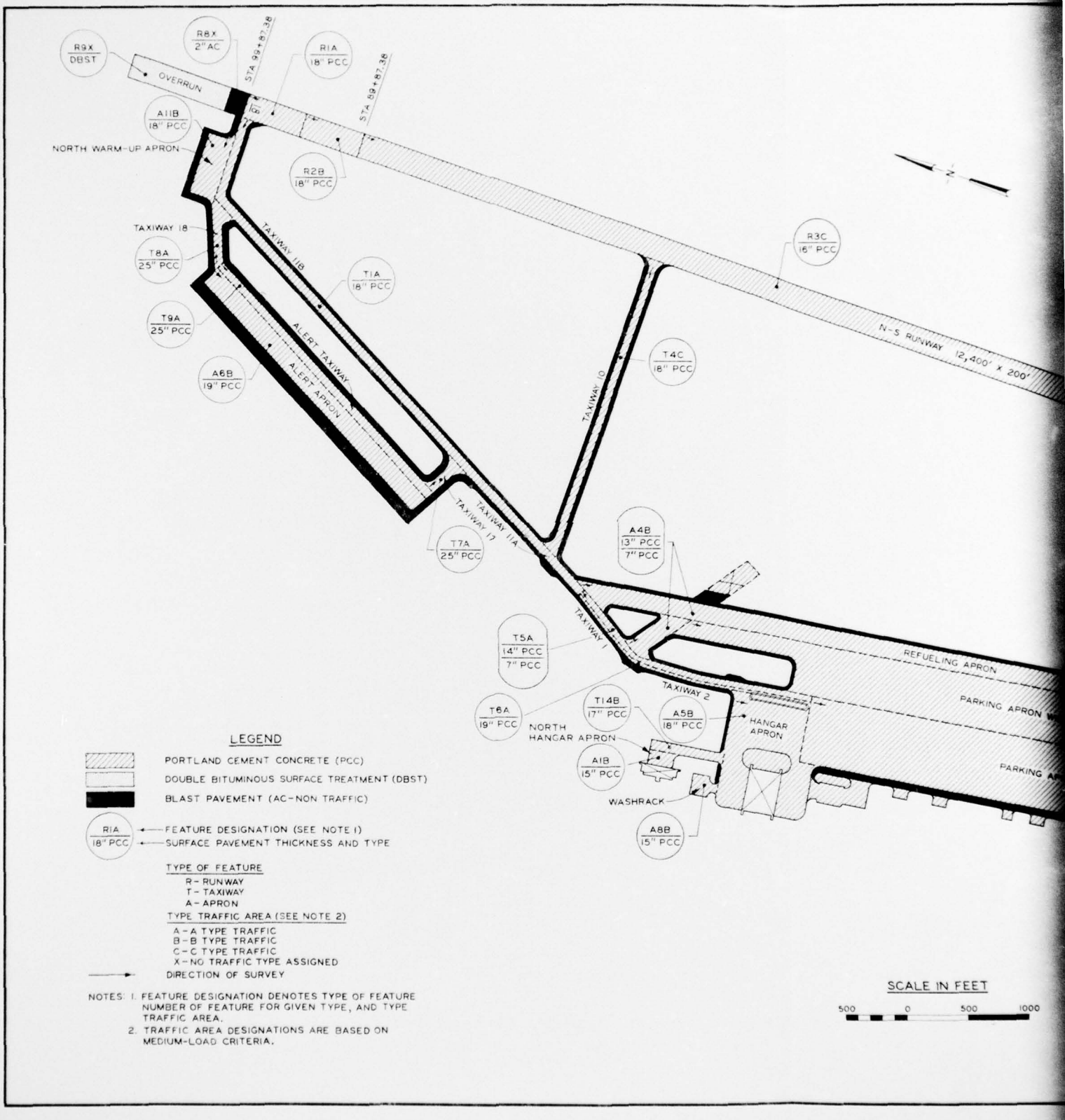
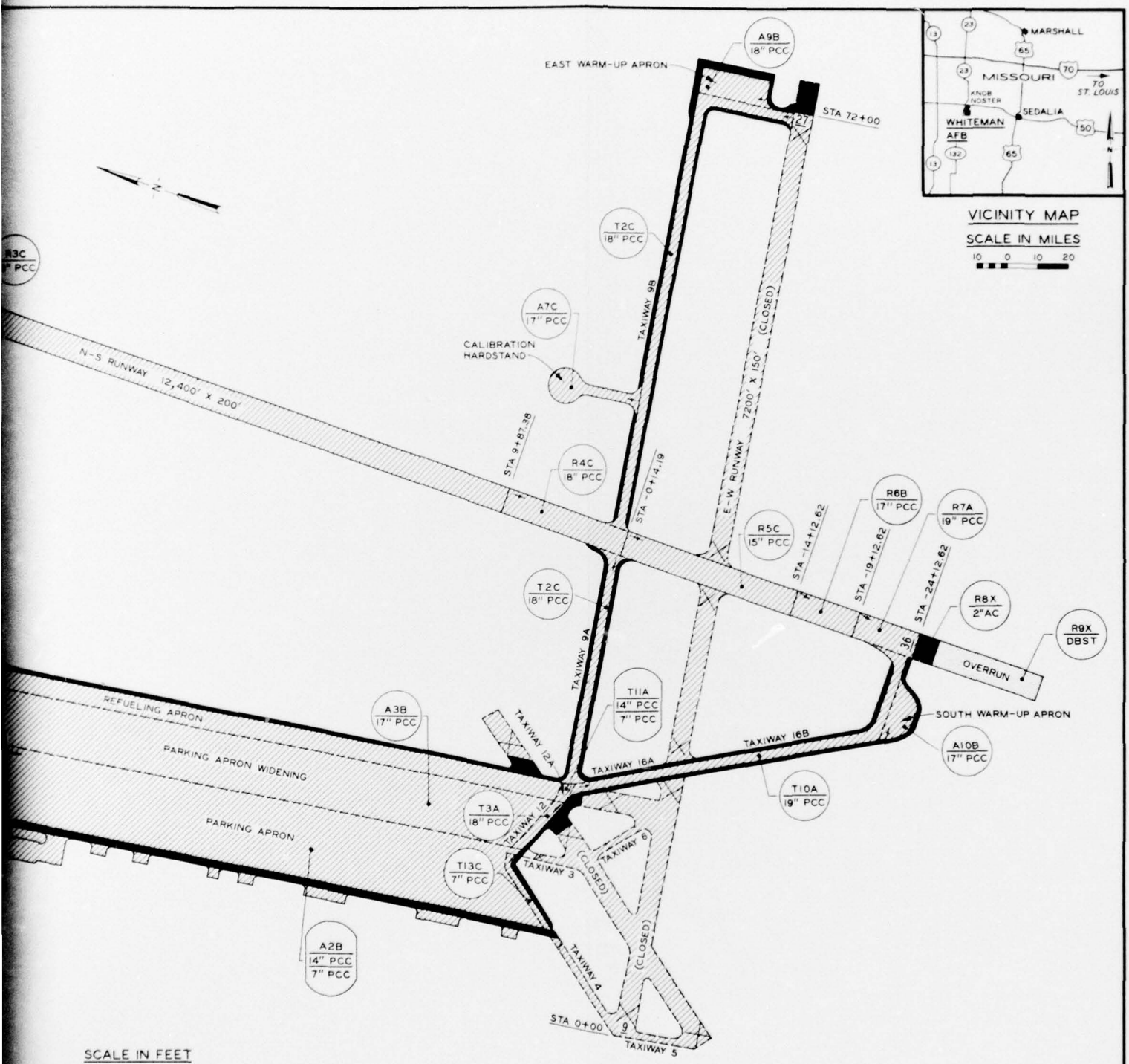


Photo 11. Epoxy patches of spalls with and without joint seal


R9X
DBST
R8X
2" AC
R1A
18" PCC
OVERRUN
STA 99+87.38
STA 89+87.38
A11B
18" PCC
NORTH WARM-UP APRON
R2B
18" PCC
TAXIWAY 18
T8A
25" PCC
TAXIWAY 11B
T1A
18" PCC
T9A
25" PCC
ALERT TAXIWAY
ALERT APRON
A6B
19" PCC
R3C
16" PCC
N-S RUNWAY 12,400' X 200'
T4C
18" PCC
TAXIWAY 10
TAXIWAY 17
TAXIWAY 11A
T7A
25" PCC
A4B
13" PCC
7" PCC
TAXIWAY 1
T5A
14" PCC
7" PCC
REFUELING APRON
TAXIWAY 2
PARKING APRON
T6A
19" PCC
NORTH HANGAR APRON
T14B
17" PCC
A5B
18" PCC
HANGAR APRON
A1B
15" PCC
WASHRACK
A8B
15" PCC
LEGEND
PORTLAND CEMENT CONCRETE (PCC)
DOUBLE BITUMINOUS SURFACE TREATMENT (DBST)
BLAST PAVEMENT (AC-NON TRAFFIC)
R1A
18" PCC
FEATURE DESIGNATION (SEE NOTE 1)
SURFACE PAVEMENT THICKNESS AND TYPE
TYPE OF FEATURE
R - RUNWAY
T - TAXIWAY
A - APRON
TYPE TRAFFIC AREA (SEE NOTE 2)
A - A TYPE TRAFFIC
B - B TYPE TRAFFIC
C - C TYPE TRAFFIC
X - NO TRAFFIC TYPE ASSIGNED
DIRECTION OF SURVEY
NOTES: 1. FEATURE DESIGNATION DENOTES TYPE OF FEATURE NUMBER OF FEATURE FOR GIVEN TYPE, AND TYPE TRAFFIC AREA.
2. TRAFFIC AREA DESIGNATIONS ARE BASED ON MEDIUM-LOAD CRITERIA.
SCALE IN FEET
500 0 500 1000



WHITEMAN AFB

AIRFIELD LAYOUT AND PAVEMENT PLAN

PLATE 1

2